Decay characteristics of lattice defect centers in quartz by UV irradiation: A physical basis for absolute dating of sediments

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We have examined the behavior of lattice defect centers in quartz irradiated with UV using ESR. As a result, it is found that an intrinsic ESR signal in quartz, peroxy center (Si-O-O), decays regularly and more rapidly with the irradiation time. The decay process of the peroxy center is not explainable by simple 1st or 2nd order reaction kinetics. Since the decay process can be divided into two linear parts on the 2nd order reaction graph, this means that multiple reactions, such as the cutting of the O-O and Si-O bonds or the recombination between excited electrons and holes, may occur during the decay process. Under strong UV emitted from sunlight in summer, the peroxy center may be almost completely reset, so that we can use it for absolute dating of marine sands or loess.